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Evaluation of community-based treatment for drug-resistant tuberculosis in Bangladesh

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Abstract

OBJECTIVE—Drug-resistant tuberculosis (TB) threatens global TB control because it is difficult to diagnose and treat. Community-based programmatic management of drug-resistant TB (cPMDT) has made therapy easier for patients, but data on these models are scarce. Bangladesh initiated cPMDT in 2012, and in 2013, we sought to evaluate programme performance.

METHODS—In this retrospective review, we abstracted demographic, clinical, microbiologic and treatment outcome data for all patients enrolled in the cPMDT programme over 6 months in three districts of Bangladesh. We interviewed a convenience sample of patients about their experience in the programme.

RESULTS—Chart review was performed on 77 patients. Sputum smears and cultures were performed, on average, once every 1.35 and 1.36 months, respectively. Among 74 initially culture-positive patients, 70 (95%) converted their cultures and 69 (93%) patients converted the cultures before the sixth month. Fifty-two (68%) patients had evidence of screening for adverse events. We found written documentation of musculoskeletal complaints for 16 (21%) patients, gastrointestinal adverse events for 16 (21%), hearing loss for eight (10%) and psychiatric events for four (5%) patients; conversely, on interview of 60 patients, 55 (92%) reported musculoskeletal complaints, 54 (90%) reported nausea, 36 (60%) reported hearing loss, and 36 (60%) reported psychiatric disorders.

CONCLUSIONS—The cPMDT programme in Bangladesh appears to be programmatically feasible and clinically effective; however, inadequate monitoring of adverse events raises some concern. As the programme is brought to scale nationwide, renewed efforts at monitoring adverse events should be prioritised.

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Keywords

Tuberculosis; drug-resistance; community; treatment; Bangladesh

Introduction

The prevalence of tuberculosis (TB) that is resistant to both isoniazid (INH) and rifampicin (RIF), or multidrug-resistant (MDR) TB, has become a significant threat to global TB control [1-3]. The response to this threat has historically been inadequate, largely because MDR TB is so difficult to diagnose and treat [3, 4]. The limited diagnostic capacity has resulted in substantial under-notification and low numbers of treated patients [4]. However, as automated nucleic acid amplification tests (NAATs), such as the GeneXpert MTB/RIF assay (Cepheid Inc., Sunnyvale, CA, USA), are being implemented and scaled up in many countries, the numbers of patients being diagnosed with drug-resistant TB is increasing quickly, exposing limitations on treatment capacity.

Conventional treatment of MDR TB requires up to 2 years of therapy, with expensive and toxic medicines, and adherence to these medical regimens is difficult. To effectively monitor adverse events and promote adherence, many national TB programmes (NTPs) developed policies for the programmatic management of drug-resistant TB (PMDT) that requires prolonged hospitalisation for the initiation of therapy. After discharge from the hospital, patients are often required to report to treatment facilities on a daily basis for drugs and monitoring. Asidefrom the high cost of such an approach and the strains it places on individuals and families, the limited number of suitable hospital beds and the lack of treatment facilities proximal to patients' residences have prohibited expansion of PMDT that adhere to this model [5].

With the rapid increase in the number of cases detected, many NTPs are struggling to expand their PMDT treatment capacity. It is generally not feasible for programmes that rely on hospital- or facility-based therapy to treat the increasing number of diagnosed cases. As a consequence, there has been growing interest in community-based PMDT (cPMDT), a strategy in which patients with MDR TB (or those on second-line therapy for any reason) are treated primarily in the communities where they live [5]. cPMDT has been used successfully by a number of smaller programmes and is being scaled up in countries where there is insufficient capacity for hospital- or facility-based treatment [6, 7]. If it is demonstrated to be safe, effective and feasible, cPMDT will likely become a widely prevalent model for the care of patients with MDR TB; currently, however, data on this model are limited.

In 2011, standard operating procedures for cPMDT in Bangladesh were developed under the guidance of advisors from Partners in Health, who have developed similar programmes in Peru, Lesotho and Russia. Enrolment into the cPMDT programme started in 2012 in one district and was extended to three additional districts by 2013. Under the cPMDT protocol, patients are generally hospitalised for the first few weeks of therapy at a specialised facility then discharged home under the care of a clinical team based at medical facilities close to where they live. The patients are visited by directly observed therapy (DOT) providers on a

daily basis. These DOT providers are not clinicians or nurses; rather, they are trained para-professionals that administer medications, including injections, and document adverse events. Although they are instructed to inquire about adverse events, DOT providers do not have specific forms to complete and are not required to document responses in a systematic way. Weekly, or sooner if the need arises, DOT providers communicate with the clinicians at the nearby medical clinic to verbally report adherence and any medical issues or adverse events.

Once a month, or sooner if they are having symptoms that require attention, patients visit clinicians at the clinic. The national cPMDT guidelines recommend creatinine and potassium serum levels and hearing assessment (by audiometry) at baseline and then monthly monitoring while the patient is treated with an injectable agent; serum liver enzymes (alanine transferase or glutamic-pyruvic transaminase) are recommended at baseline and then every 6 months, or sooner if deemed necessary. All clinical notes are supposed to be documented in the patient medical chart by the clinician onto specific cPMDT forms. These forms have spaces for ‘free text’ documentation of adverse events, but do not prompt for answers to specific questions or symptoms; there are specific spaces to document results from radiographs and serum testing, but no specific space to document audiometry results. Patient medical charts are maintained at the clinic where the patients visit monthly.

In this study, we sought to describe the performance and feasibility of the cPMDT programme at an early stage of its operation to identify successes as well as gaps and deficiencies in operations.

Methods

Study design

We conducted a retrospective cohort study of patients participating in cPMDT. Medical charts were reviewed and patient interviews were conducted by trained study personnel to assess patient perceptions and attitudes about the management of their TB.

Study population

At the time of the evaluation, four districts had initiated cPMDT activities; we selected the three districts in Bangladesh where NTP cPMDT activities had been initiated at least 6 months prior to the time of the study: Gazipur, Narayanganj and Chittagong. In September 2013, we abstracted data on all participating cPMDT patients in those districts who had been enrolled for longer than 6 months. We attempted to interview as many patients as possible, given time and travel constraints. Patients were contacted by cPMDT personnel and asked whether they would be willing to participate. Patients were interviewed by members of the study team; the order of patient contact was determined by convenience, and we stopped interviewing patients when resources were exhausted.

Study procedures

We collected demographic and clinical data from the medical charts in the treatment facilities that the patients visited for monthly clinical follow-up, and microbiologic laboratory data from the laboratories to which specimens from these patients were sent. Medical charts were reviewed carefully for documentation of the occurrence or treatment of adverse events; any documentation or clinical decision in regard to an adverse event was taken as documentation. We interviewed available patients individually in their homes or communities to help ensure confidentiality of their responses. In interviews, we asked patients to state whether they agreed with, disagreed with or were unsure about statements describing various aspects of their TB care (for example, 'I am satisfied with the medical care I receive from my DOT provider'). Patients were also asked to estimate the frequency of blood and sputum testing from a set list (for example, 'weekly, monthly, every 2 months, or less than every 2 months').

Study definitions

Study outcome measures included feasibility, defined as the extent to which an intervention can be carried out in a specific setting; fidelity, defined as the degree to which an intervention was implemented as it was designed; and acceptability, defined as the perception among stakeholders that the intervention was agreeable [8, 9]. We also sought to assess effectiveness of the cPMDT programme by documenting the proportion of patients with successful outcomes (i.e. converted from sputum culture positive to sputum culture negative) and the proportion who were lost to follow-up.

Data management and analysis

All data were collected onto standardised data collection forms developed for this study. Data from each form were double-entered into two separate Microsoft Access databases by two different data entry personnel working independently. All discrepancies in databases were resolved by consulting with the original study documents and the interviewers who completed them. Study data are presented as frequencies and proportions; data were analyzed using Microsoft Access and SAS version 9.3.

Ethics

The study received approval from the research determination board at ICDDR, B, and was determined to be a non-research study at the US CDC.

Results

Demographic and clinical data

At the time of data abstraction, 77 patients had been or were being treated in the cPMDT programme for longer than 6 months in the three study districts; we abstracted microbiologic data on all of them. The median age was 28 (interquartile range 22–40) years, 34 (44%) were female, and HIV status was documented for 15 (21%), none of whom were HIV-infected. Clinical and demographic data for these patients are presented in Table 1. At the time of data abstraction, duration of treatment for these patients ranged from seven to 24

months (median = 14); 8 (10%) patients completed therapy and had a final outcome recorded: six met criteria for cure, one had died and one failed treatment. No patients were lost to follow-up.

Sputum smears and cultures were performed routinely on patients, with a mean time interval of 1.35 and 1.36 months between reported smear and culture results, respectively (minimum and maximum time interval for culture results: 0.58 and 2.5 months, respectively). Three patients had negative cultures at the start of therapy and throughout surveillance. Of the remaining 74, 70 (95%) had converted to culture negative (i.e. had two or more negative cultures from specimens taken at least 30 days apart with no subsequent positive cultures) [10]. Five patients had positive cultures in the sixth or a subsequent month; treatment failure was registered as the final outcome for one, and therapy was continuing at the time of data abstraction for four, two of whom had converted to culture negative after the sixth months.

In patient medical charts, we found documentation of musculoskeletal complaints for 16 (21%) patients, gastrointestinal adverse events (including nausea) for 16 (21%), hearing impairment for eight (10%), anorexia for five (6%), sleep disturbance for five (6%), and psychiatric events for four (5%) patients. Other than these recorded findings, we did not find documentation of screening for other symptoms or adverse events.

Fifty-two (68%) patients had evidence of laboratory surveillance for adverse events after treatment initiation in their medical charts. Forty-five (58%) patients had documentation of a creatinine test, 38 (84%) of whom had only one test documented; among those tested, only one had an elevated serum creatinine (1.5 mg/dl). Forty-four (57%) patients had documentation of alanine transaminase (ALT) or aspartate transaminase tests, 37 (84%) of whom had only one test documented; among those tested, three had mildly elevated ALT (all under 120 IU/l). Three (4%) patients each had a single test for potassium documented, and one (1%) patient had documentation of testing for thyroid-secreting hormone (TSH), all of which were within normal limits.

Data from patient interviews

Sixty (78%) of 77 patients were contacted and all agreed to be interviewed. Among those, the vast majority agreed that their caretakers were knowledgeable and explained things in a way that they could understand. Almost all patients reported that they visited the medical clinic and that their DOT provider visited them according to schedule. Almost all patients reported monthly sputum collection (Table 2).

When patients were asked to recall adverse events associated with therapy, 55 (92%) reported pains in their joints, 54 (90%) patients reported nausea, 36 (60%) reported hearing loss, 36 (60%) reported noticeable changes in mood or perceptions of reality (‘difficulties knowing what is real and what is not’), and 13 (22%) reported diarrhoea.

Responses to questions about how to improve treatment of persons with MDR TB are summarised in Table 2. When asked whether they agreed with specific ways to improve the programme, 63% of patients agreed that the NTP could provide more transportation and 83% agreed that the programme could provide more food assistance; responses were more

mixed when asked whether they thought the NTP could educate patients better, educate DOT providers better, use better medications and use fewer medications. No patients agreed that using more medications was needed to improve treatment of MDR TB. When asked whether they had any other recommendations for improving MDR TB treatment (an open-ended question), five patients responded, four of whom recommended increased financial assistance and one recommended that the NTP offer employment to current and former patients.

Discussion

The cPMDT programme in Bangladesh has established proof that the concept is feasible and acceptable there. Patients are seen regularly and are satisfied with the medical care they receive from their DOT providers, loss to follow-up was not seen at the time of this review, and microbiologic outcomes at six months were very good. There was, however, little evidence that adverse events were properly monitored or addressed; this shortcoming is disconcerting and warrants attention.

Despite the fact that patients were treated outside of a hospital setting, microbiologic surveillance was very good, and patients had close microbiologic monitoring for refractory or recrudescent disease. The vast majority of patients saw their healthcare providers as scheduled and were visited daily by their DOT providers. Sputum culture conversion at 6 months has been shown to be a good predictor of treatment outcome, [11] and in well-performing programmes, this has been reported in 81–87% of patients [11-13]. In this cohort, 88% of patients with initially positive sputum cultures converted their cultures before the sixth month, suggesting very good response to treatment. In addition, no patients were lost to follow-up over a median of 14 months of treatment; by comparison, rates of loss to follow-up were as high as 28% for the nationwide 2008 cohort of MDR patients, and 14% for the 2011 cohort, although these rates are final outcomes [14, 15]. These data suggest the programme is effective at this early stage of scale-up.

The overall structure and design of the cPMDT programme in Bangladesh was similar to that implemented in other countries where the experience has been documented and published (Table 3). DOT providers are perhaps the most critical part of the success of a community-based approach; in the successful examples in the published literature, they were trained, supervised and compensated. Compensation is probably an important reason for the programmes' successes and is a central aspect in determining feasibility of scale-up. In Bangladesh, compensation is provided by the NTP with funds that come from the Ministry of Health and the Global Fund to Fight AIDS, Tuberculosis and Malaria. Stability of funding is an essential determinant of programme feasibility; if funding remains stable, the programme appears to be feasible as designed and currently implemented.

Loss to follow-up is one of the most disconcerting outcomes in PMDT programmes and often results when patients feel better and do not appreciate the need for ongoing therapy, or when patients find an aspect of a programme or treatment unacceptable (e.g. adverse reactions to medications). Patients who are lost to follow-up may get sicker or die or may subsequently take ineffective or partially effective treatments and transmit increasingly

resistant strains of TB in the community. Patient interviews suggest that the community DOT providers were well-trained and capable and that clinicians formed good rapport with their patients. The fact that no patients were lost to follow-up in the selected districts and the positive reviews of providers by interviewed patients indicates that patients found this cPMDT acceptable [8].

There was sparse documentation of adverse events, with little documentation of serum monitoring or patient symptoms in the medical charts. By comparison, when asked, almost all patients reported nausea, and a clear majority reported hearing loss and changes in mood or perception. These findings are based on personal, subjective evaluation, but are more consistent with other literature documenting adverse events in patients treated for MDR TB, which has reported nausea in up to 75%, hearing loss in up to 62% and psychiatric disorders in up to 29% of patients [16-21]. This large discrepancy between patient report and documentation in the medical chart is a cardinal finding of this review and is worrisome. The lack of documentation in the patient medical charts raises concern that these issues were not properly monitored, recognised or addressed and suggests that the cPMDT had limited fidelity in regard to monitoring of adverse events [8]. The high proportion of patients with subjective hearing impairment is a particular concern, as this is often a permanent consequence of treatment, and early recognition may improve outcome [22]. It is presumed that when adverse events are not addressed, patient satisfaction will be compromised, but we did not find evidence for that. Indeed, one of the more interesting findings in this assessment is the high degree of patient satisfaction despite the prevalence of adverse events. Importantly, however, our review did not follow all patients to completion of therapy.

There are important limitations to our review. First, the sample was small and chosen for convenience, and our findings are not directly generalisable to the entire programme nor to other programmes. Our data do not necessarily portend how the programme will perform when brought to scale. However, we did collect data on almost half of the patients enrolled in the cPMDT programme at the time, and there were no substantial differences in microbiologic outcomes between patients from different districts; we have no reason to believe that the patients we investigated were treated any differently from the others. Second, the primary data source for medical monitoring was the medical chart, and these may incompletely capture surveillance and treatment efforts. It is possible that patients had more complete evaluations than were documented. Third, we only report interim outcomes and cannot comment conclusively on final TB outcomes for this programme. Fourth, most interview questions were close-ended questions, which may have prompted or limited responses. However, open-ended questions were asked as follow-up, and patients infrequently elaborated. Factual data reported by patients were subject to recall and social desirability biases.

Conclusions

This review of the cPMDT programme in Bangladesh demonstrates the feasibility of running a successful community-based programme with good microbiologic outcomes and apparently high satisfaction among patients, but also suggests that more attention needs to be given to the monitoring and treatment of adverse events. Screening for adverse events can

be made more routine and robust by the use of forms that document ‘yes’ or ‘no’ responses to questions about specific symptoms (e.g. nausea, hearing loss, mood or perception disorders) and by patient and/or DOT provider initialisation to document concurrence. Chart forms can also be used to prompt next steps if any adverse events are noted. Appropriate charting can help clarify confusion about whether the deficiency is one of clinical care or data recording and should help to improve clinical care. Intermittent quality assessment of medical charts can be performed by cPMDT programme personnel and/or by DOT providers themselves to ensure that patient symptoms are recognised and addressed. cPMDT has now been shown to have been successfully implemented in an increasing number of countries and is likely to become the predominantmodel for treating MDR TB; with close attention to monitoring and care, treatment outside of a healthcare facility can simultaneously improve acceptability and quality/success.

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References

1. Global Tuberculosis Control. WHO Report 2014. World Health Organization; Geneva, Switzerland: 2014.
2. Falzon D, Mirzayev F, Wares F, et al. Multidrug-resistant tuberculosis around the world: what progress has been made? Eur Respir J. 2015; 45:150–160. [PubMed: 25261327]
3. Chiang CY, Van Weezenbeek C, Mori T, Enarson DA. Challenges to the global control of tuberculosis. Respirology. 2013; 18:596–604. [PubMed: 23551328]
4. Daley CL. Global scale-up of the programmatic management of multidrug-resistant tuberculosis. Indian J Tuberc. 2014; 61:108–115. [PubMed: 25509932]
5. Bassili A, Fitzpatrick C, Qadeer E, Fatima R, Floyd K, Jaramillo E. A systematic review of the effectiveness of hospital- and ambulatory-based management of multidrug-resistant tuberculosis. Am J Trop Med Hyg. 2013; 89:271–280. [PubMed: 23926140]
6. Weiss P, Chen W, Cook VJ, Johnston JC. Treatment outcomes from community-based drug resistant tuberculosis treatment programs: a systematic review and meta-analysis. BMC Infect Dis. 2014; 14:333. [PubMed: 24938738]
7. Meeting Report: a ministerial meeting of high M/XDR burden countries. World Health Organization; Geneva, Switzerland: 2009.
8. Proctor E, Silmere H, Raghavan R, et al. Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. Adm Policy Ment Health. 2011; 38:65–76. [PubMed: 20957426]
9. Peters, D.; Tran, N.; Adams, T. Implementation Research in Health: A Practical Guide. World Health Organization; Geneva, Switzerland: 2013.
10. Revised definitions and reporting framework for tuberculosis. World Health Organization; Geneva,Switzerland: 2013.
11. Kurbatova EV, Cegielski JP, Lienhardt C, et al. Sputum culture conversion as a prognostic marker for end-of-treatment outcome in patients with multidrug-resistant tuberculosis: a secondary analysis of data from two observational cohort studies. Lancet Respir Med. 2015; 3:201–209. [PubMed: 25726085]

12. Tierney DB, Franke MF, Becerra MC, et al. Time to culture conversion and regimen composition in multidrug-resistant tuberculosis treatment. PLoS ONE. 2014; 9:e108035. [PubMed: 25238411]
13. Joseph P, Desai VB, Mohan NS, et al. Outcome of standardized treatment for patients with MDR-TB from Tamil Nadu, India. Indian J Med Res. 2011; 133:529–534. [PubMed: 21623039]
14. Annual Report. National Tuberculosis Control Program; Bangladesh: Dhaka, Bangladesh: 2010.
15. Annual Report. National Tuberculosis Control Program; Bangladesh. Dhaka, Bangladesh: 2013.
16. Avong YK, Isaakidis P, Hinderaker SG, et al. Doing no harm? Adverse events in a nation-wide cohort of patients with multidrug-resistant tuberculosis in Nigeria. PLoS ONE. 2015; 10:e0120161. [PubMed: 25781958]
17. Bloss E, Kuksa L, Holtz TH, et al. Adverse events related to multidrug-resistant tuberculosis treatment, Latvia, 2000-2004. Int J Tuberc Lung Dis. 2010; 14:275–281. [PubMed: 20132617]
18. Modongo C, Sobota RS, Kesenogile B, et al. Successful MDR-TB treatment regimens including amikacin are associated with high rates of hearing loss. BMC Infect Dis. 2014; 14:542. [PubMed: 25300708]
19. Wu S, Zhang Y, Sun F, et al. Adverse events associated with the treatment of multidrug-resistant tuberculosis: a systematic review and meta-analysis. Am J Ther. 201310.1097/01.mjt.0000433951.09030.5a
20. Shin SS, Pasechnikov AD, Gelmanova IY, et al. Adverse reactions among patients being treated for MDR-TB in Tomsk, Russia. Int J Tuberc Lung Dis. 2007; 11:1314–1320. [PubMed: 18034952]
21. Isaakidis P, Varghese B, Mansoor H, et al. Adverse events among HIV/MDR-TB co-infected patients receiving antiretroviral and second line anti-TB treatment in Mumbai, India. PLoS ONE. 2012; 7:e40781. [PubMed: 22792406]
22. Sturdy A, Goodman A, Jose RJ, et al. Multidrug-resistant tuberculosis (MDR-TB) treatment in the UK: a study of injectable use and toxicity in practice. J Antimicrob Chemother. 2011; 66:1815–1820. [PubMed: 21642291]

Table 1

Demographic and clinical characteristics of drug-resistant tuberculosis patients treated in the community

Characteristics	*n* (%)
District	
Gazipur	11 (14)
Narayanganj	15 (19)
Chittagong	51 (67)
Age in years, median [IQR]	28 (22–40)
Age groups	
< 24	26 (35)
24–34	26 (33)
35–49	15 (19)
≥50	10 (13)
Gender	
Male	43 (56)
Female	34 (44)
Employment status	
Unemployed	32 (41)
Employed	20 (26)
Other (e.g. student, retired and housewife)	13 (17)
Unknown	12 (17)
Current smoker	
No	60 (78)
Yes	4 (5)
Unknown	13 (17)
Alcohol use (greater than 14 drinks a week for men, 10 drinks a week for women)	
No	57 (74)
Yes	3 (4)
Unknown	17 (22)
Diabetes diagnosis	
No	23 (30)
Yes	7 (9)
Unknown	47 (61)
HIV status	
HIV-infected	0 (0)
HIV-negative	15 (21)
Unknown	62 (79)
Chest radiograph or chest computerised tomography scan within 4 weeks of enrolment	
No	1 (1)
Yes	18 (24)
Unknown	58 (74)

Characteristics	*n* (%)
Results of radiography (*n* = 18)	
Unilateral abnormality	9 (50)
Bilateral abnormality	7 (39)
Unknown	2 (11)
Cavitary disease on radiography (*n* = 19)	
No	5 (28)
Yes, unilateral	3 (17)
Yes, bilateral	3 (17)
Unknown	7 (39)
Site of disease	
Pulmonary only	75 (97)
Extrapulmonary only	1 (1)
Unknown	1 (1)
MDR TB registration category	
Relapse	7 (9)
Treatment after failure or delayed conversion	69 (90)
Treatment after default	1 (1)
Rifampin resistant (*n* = 73)*	72 (99)
Isoniazid resistant (*n* = 73)*	66 (90)

* Four patients had no documentation of DST in their charts; one patient was documented as susceptible to rifampicin, but was treated with second-line agents due to intolerance.

Table 2

Responses from patient interviews

'These first statements are about the healthcare team at the clinic where you receive care'.

	Agree *n* (%)	Unsure *n* (%)	Disagree *n* (%)
I am satisfied with the medical care I receive from my healthcare team.	57 (95)	1 (2)	2 (3)
The doctors and nurses are knowledgeable.	56 (93)	2 (3)	2 (3)
The doctors and nurses explain things to me in a way that I can understand.	59 (98)	0	1 (2)
My healthcare team treats me with respect.	58 (97)	0	2 (3)

'The next statements are about the healthcare worker who comes to your house'.

	Agree *n* (%)	Unsure *n* (%)	Disagree *n* (%)
I am satisfied with the medical care I receive from my DOT provider.	59 (98)	1 (2)	0
The DOT provider knows a lot about TB.	57 (95)	2 (3)	1 (2)
The DOT provider explains things to me in a way that I can understand.	58 (97)	1 (2)	1 (2)
The DOT provider treats me with respect.	58 (97)	1 (2)	1 (2)
The DOT provider who comes to my house is caring.	58 (97)	1 (2)	1 (2)
I trust the DOT provider will do what is best for me.	59 (98)	0	1 (2)
The DOT provider checks each day to make sure my body is not reacting badly to my TB medicines.	56 (93)	0	4 (7)
My DOT provider listens to me when I talk.	59 (98)	0	1 (2)

	Every day *n* (%)	5 days a week *n* (%)	2–3 days a week *n* (%)	Once a week *n* (%)	Less than once a week *n* (%)
How often does the healthcare worker (the DOT provider) visit you?	58 (97)	1 (2)	1 (2)	0	0

	Once a month *n* (%)	Once every 2–3 months *n* (%)	Once every 3–4 months *n* (%)	Once every 5–6 months *n* (%)	I never go *n* (%)
How often do you go to the Upazila Health Complex or health clinic for a check-up?	58 (97)	1 (2)	1 (2)	0	0

	Once a week *n* (%)	Once a month *n* (%)	Once every 2 months *n* (%)	Less than once every 2 months *n* (%)
How often have you provided sputum for testing?*	2 (3)	57 (95)	0	0

	Once a week *n* (%)	Once a month *n* (%)	Less than once a month *n* (%)
How often have you had your blood drawn for testing?	1 (2)	30 (50)	29 (48)

Responses to the question, 'Which of the following do you think the national TB programme can do to make the treatment of patients with your kind of TB better?', *n* = 60

	Agree *n* (%)	Disagree *n*(%)	Unsure *n* (%)
Provide more transportation	38 (63.3)	20 (33.3)	2 (3.3)
Provide more food assistance	53 (88.3)	2 (3.3)	5 (8.3)
Educate patients better	30 (50.0)	28 (46.7)	2 (2.2)
Educate DOT providers better	25 (41.7)	30 (50.0)	5 (8.3)
Use better medications	19 (31.7)	37 (61.7)	4 (6.7)
Use more medications	0 (0)	57 (95.0)	3 (5.0)
Use fewer medications	30 (50.0)	26 (43.3)	4 (6.7)

Table 3

Profiles of established community-based programmes for multidrug-resistant tuberculosis

Country	Peru	Tomsk, Russia	Lesotho	Bangladesh
Programme launched	August 1996	September 2000	August 2007	June 2012
Where is MDR TB care provided?	At patient's home or convenient proximal location	At patient's home (20%) or at proximal TB facilities	At patient's home	At patient's home
Who provides DOT?	CHW	Nurse only	CHW or nurse	CHW
How often is DOT provided for patients with MDR TB?	6 days/week; 1–2 times/day	6 days/week; 1–2 times/day	6 days/week; 2 times/day	7 days/week; 1/day
How many patients does each DOT worker observe?	3–4 patients	In outpatient clinic it can be 20–40/day. Through treatment at home – up to 20/day.	1–3 patients	1–2 patients
Is DOT provider paid?	Yes	Yes – paid a typical nurse salary	DOT providers receive social support at same level as patient	Yes, monthly incentive upon completion of preceding month's responsibilities (~23 USD), plus mobile phone top–up, plus fixed amount for patient and specimen transportation costs
What training does DOT worker receive?	1-day training on DOT, TB, medications, side effects	Specialised training on TB medications, side effects, support of adherence, follow-up tests, etc.	1 day training on DOT, TB, medications, side effects, psychological support; monthly refresher training	1 day training on DOT, TB, medications, side effects, psychological support and support of adherence; monthly refresher training
DOT supervisors	Health promoters, in close contact with nurse from the nearest clinic	Chief nurse from the medical facility	DOT coordinator, in close contact with nurse from the nearest clinic	Clinicians at proximal health facility
Role of nurses	Perform screenings, identify patients, supervise health promoters and DOT workers, manage adverse events and adherence issues, maintain medical records, monitor monthly smears and cultures, as well as other laboratory tests	All clinical and administrative activities: provide DOT, monitor side effects, provide follow-up and social support	Identify patients, supervise CHWs, manage adverse events and adherence issues, monitor monthly smears and cultures, as well as other laboratory tests	Take care of patients in the hospital setting and supportive role at proximal health facility
Any incentives or enablers to the patient provided?	Minimal (some patients get support for transportation to the health centre; ~10% of patients provided with temporary housing and food	Daily food sets. $1.7–2/day.	Food baskets biweekly; free transportation to and from hospital	Financial support for food and transportation
How widespread is cPMDT?	Almost entire country	Entire Tomsk region covered, including TB prison, but only ~20% of patients treated as cPMDT; the rest – through ambulatory care	Entire country	4 provinces (19 of 64 districts) (as of September 2013)

Country	Peru	Tomsk, Russia	Lesotho	Bangladesh
Infection control (IC) in the community	All staff are provided with respirators	All staff are provided with respirators. IC control is organised in the TB hospital.	All staff are provided with respirators.	Infection control in the patient's home formally assessed; CHW and family members receive disposable N-95 masks monthly.
MDR TB treatment Outcomes	2010 cohort: Successful: 67%; lost to follow-up: 20%; failed: 6%; died: 7%	2011 cohort: Successful: 68%, lost to follow-up: 8%; failed: 13%; died: 11%	2008–2009 cohort: Successful: 62%; lost to follow-up: 2.5%; failed: 1.5%; died 34%	

CHW, community health worker; DOT, directly observed therapy; cPMDT, community-based programmatic management of drug-resistant tuberculosis; IC, infection control.